Chapter 2: Scope and Application

S&A

2.0 CHAPTER OVERVIEW

This chapter discusses when and how the *Standards* apply to a building. The Introduction section (2.1) presents the basic scope of the *Standards.* It explains the definitions that must be understood to have a precise understanding of the scope and application.

The third section (2.2) explains the application of the *Standards* to a variety of typical non-residential building and permitting situations. This chapter does not discuss the specific requirements of the *Standards*; these are discussed in Chapters 3, 4 and 5.

Chapter Contents

2.1 INTRODUCTION

2.1.1 When Standards Apply (§100(a)1, 2, 3)

The *Standards* apply to any new construction that requires a building permit, whether for an entire building or for adding a few lighting fixtures (Section 100). The primary enforcement mechanism of the *Standards* is through the building permitting process. Until the building department is satisfied that the building complies with all applicable code requirements, including the energy *Standards,* it may withhold the building permit (or, after construction, the occupancy permit).

The *Standards* apply only to the construction that is the subject of the building permit application (with the exception of existing spaces that are "conditioned" for the first time, in which case existing envelope and lighting systems also must show compliance with the *Standards*).

The *Standards* apply only to buildings that are *directly, indirectly or semi-conditioned* by *mechanical heating* or *mechanical cooling (*Section 100(a)). Subsection 2.1.2 provides detailed definitions of these terms.

A. Nonresidential Standards

The *1998 Energy Efficiency Standards for Nonresidential Buildings, High-Rise Residential Buildings, and Hotels/Motels* are effective after July 1, 1999. They apply to nearly all buildings not covered by the residential *Standards*. These include the following Uniform Building Code Occupancy Groups:

UBC Groups A, B, E, F, H, M, R (limited) and S

These buildings include (but are not limited to):

- Offices
- Retail and wholesale stores
- Grocery stores
- Restaurants
- Assembly and conference areas
- Industrial work buildings
- Commercial or industrial warehouses
- Schools
- Churches
- Theaters
- Apartment buildings with four or more habitable stories
- Hotels and Motels

The *Standards* do not apply to UBC Groups I and U. These groups include such buildings as hospitals, daycare, nursing homes, prisons, private garages and agricultural buildings.

The *Standards* also do not apply to buildings that fall outside the jurisdiction of California building codes, such as mobile structures.

The final exception to the *Standards* is qualified historic buildings, as defined in the State Historic Building Code (Title 24, Part 8) (exception to Section 100(a)).

Example 2-1: Research Greenhouse

Question

A company engaged in agricultural research has a greenhouse appended to its office building. It is devoted exclusively to cultivating exotic plants and is conditioned to maintain a set temperature of 80°F. Is it subject to glazing restrictions and envelope heat gain limits?

Answer

It depends upon the UBC Group designation of the greenhouse. If it is designated an agricultural building (Group U), then it is exempt from the Standards. If it is designated part of the B office occupancy, then it would be subject to the applicable glazing, lighting and other standards.

B. Residential Standards

The *1998 Energy Efficiency Standards for Low-Rise Residential Buildings* are also effective after July 1, 1999. These *Standards* cover single-family and low-rise residential buildings (occupancy groups R1 and R3) including:

- All single-family dwellings of any number of stories
- All duplex (two-dwelling) buildings of any number of stories
- All multi-family buildings with three or fewer habitable stories
- All occupancy group R2 buildings with three or fewer habitable stories
- Additions to all the above buildings

The applicable design manual for those buildings is the *Residential Manual for Compliance with the Energy Efficiency Standards for Low-Rise Residential Buildings.*

Copies of the compliance manuals and other relevant publications may be obtained by contacting the Energy Commission (see Appendix F).

2.1.2 Basic Scope and Application Concepts

The following discussion explains the definitions of the key terms for understanding the scope and application of the *Standards*. In most cases, a careful reading of these definitions will resolve questions of interpretation. These definitions are located in Section 101 of the *Standards;* italicized words below indicate the wording taken verbatim from that Section.

A. Conditioned Space Definitions

Building *is any structure or space for which a permit is sought.* By this definition, a building is not necessarily a complete physical structure. For the *Standards,* a building in this sense can be a lighting system recircuiting project, because this would require an electrical permit.

Conditioned Floor Area (CFA) *is the floor area (in square feet) of enclosed conditioned space on all floors of a building, as measured at the floor level of the exterior surfaces of exterior walls enclosing the conditioned space.* Once the spaces that are directly or indirectly conditioned are identified, then it is possible to calculate the conditioned floor area of the building. This number is used for various calculation purposes in complying with the *Standards.* The CFA is generally calculated from dimensions on the floor plans of the building. It is measured from the outside surfaces of exterior walls, with the dimensions taken at floor level. This definition helps mitigate any complexity from sloping walls, bay windows and other unique building details.

Conditioned Space *is space in a building that is either directly conditioned, indirectly conditioned or semi-conditioned.* In most circumstances it is obvious whether a space is conditioned or semi-conditioned. There are, however, special circumstances that require a closer look at the definitions of directly and indirectly conditioned space.

Directly Conditioned Space *is an enclosed space that is provided with wood heating, is provided with mechanical heating that has a capacity exceeding 10 Btu/(hr-sf), or is provided with mechanical cooling that has a capacity exceeding 5 Btu/(hr-sf), unless the space conditioning system is designed and thermostatically controlled to maintain a process environment temperature less than 55°F or to maintain a process environment temperature greater than 90°F for the whole space that the system serves, or unless the space conditioning is designed and controlled to be incapable of operating at temperatures above 55°F or incapable of operating at temperatures below 90°F at design conditions.* This definition contains several key ideas central to the *Standards*. First, mechanically heated or mechanically cooled space (discussed below) may be conditioned (i.e., it does not have to be both heated and cooled). Second, it depends on how much heating or cooling is provided to determine if the space is directly conditioned. It is not uncommon for an otherwise unheated space (such as a warehouse) to have a small area with a unit heater, such as a desk on the loading dock. This usually does not make the entire structure a heated space (see also semi-conditioned space). The total quantity of heating provided to the space has to exceed 10 Btu/(hr-sf). Similar logic applies to a mechanical cooling system; if it provides more than 5 Btu/(hr-sf), it means the space is directly conditioned. Third, it matters at what the temperature the space is controlled. Many spaces, such as refrigerated warehouses, are conditioned but are deliberately kept at very hot or cold temperatures. The space conditioning is not for human comfort but to serve the needs of some process, such as preventing vegetables from spoiling. If the space conditioning system is specifically designed and operated to maintain a temperature that is not within the range of 55°F through 90°F and is thermostatically controlled not to operate within this temperature range, then the space is not directly conditioned, and is therefore exempt from the *Standards*. NOTE: the reference to wood heating in the above *Standards* definition of **Directly Conditioned Space** pertains to low-rise residential buildings only, Section 100(a)3.B. Nonresidential building with wood heat are semi-conditioned.

Example 2-2: Direct Heating

Question
If a space were 1,000 sf, how large would the heating system have to be to make the space directly conditioned?
Answer
The heating system would have to be larger than 10 Btu/(hr-sf) x 1,000 sf = 10,000 Btu/hr output to meet the definition of directly conditioned space.

Example 2-3

Question
A water treatment plant has a heating system installed to prevent pipes from freezing. The heating system exceeds 10 Btu/(hr-sf) and operates to keep the space temperature from falling below 50°F. Is this plant directly conditioned?
Answer
Not if the heating system is sized to meet the building load at 50°F and is thermostatically controlled to prevent operating temperatures above 50°F. The definition of directly conditioned space excludes spaces that have space conditioning designed and controlled to be incapable of operating at temperatures above 55°F at design conditions. Under these conditions, the space is not directly conditioned.

Example 2-4: Direct Cooling

Question
A manufacturing facility will have space cooling to keep the temperature from exceeding 90°F. If the thermostat will not allow cooling below 90°F is this facility directly conditioned?
Answer
No, this facility is not directly conditioned. The definition of directly conditioned space excludes spaces where the space conditioning system is designed and controlled to be incapable of operating at temperatures below 90°F at design conditions.

Enclosed Space *is space that is substantially surrounded by solid surfaces.* Spaces that are not enclosed are spaces that are open to the outdoors, such as covered walkways, parking structures that are open or have fenced mechanical enclosures.

Entire Building *is the ensemble of all enclosed space in a building, including the space for which a permit is sought, plus all existing conditioned and unconditioned space within the structure.* This definition affects lighting compliance within the complete building method.

Habitable Story *is a story that contains space in which humans may work or live in reasonable comfort, and that has at least 50 percent of its volume above grade.* This definition is important in distinguishing between high-rise and low-rise residential buildings, which are covered by different *Standards* and are described in separate *Manuals*. Basement floors with more than 50 percent of their volume below grade are not counted as habitable stories regardless of their actual use. In buildings on sloping ground, the calculation of volume below grade can become cumbersome, but for most buildings it will be obvious whether the floor is at least 50 percent above grade.

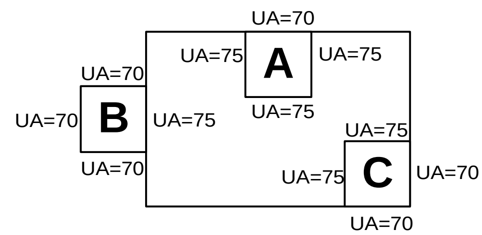
Indirectly Conditioned Space *is enclosed space including, but not limited to, unconditioned volume in atria, that (1) is not directly conditioned space; and (2) either (a) has an area-weighted heat transfer coefficient to directly conditioned space exceeding that to the outdoors or to unconditioned space, or, (b) is a space through which air from directly conditioned spaces is transferred at a rate exceeding 3 air changes per hour.* This definition is important because the *Standards* treat indirectly conditioned space the same as conditioned space; in other words, indirectly conditioned spaces must meet the requirements of the *Standards*. As a guide, professional judgment should be exercised when determining whether a space is *indirectly conditioned*, especially as relates to door placement in the space. When an enclosed space that is not directly conditioned has openings only into a conditioned space, it should be considered indirectly conditioned. Likewise, when an enclosed space that is not directly conditioned has openings only to the outdoors, it should be considered to be unconditioned. When enclosed spaces that are not directly conditioned have openings both to the outdoors and to conditioned spaces, an evaluation of relative heat transfer and air change rate (UA) (see Example 2-5) should be used to determine the status of the space. A typical example of an indirectly conditioned space might be the stairwell of a high-rise office building. The first part of the definition is that it not be directly conditioned. This is not uncommon in stairwells. The second part of the definition is that it be provided with space conditioning energy from a space that is directly conditioned. This can be done one of two ways. The first is by conduction heat transfer. If heat is transferred in from directly conditioned space (e.g., through the walls of the stairwell) faster than it is transferred out to the unconditioned surroundings, then the space is considered to be indirectly conditioned (see Example 2-5). The second way is for the space to be ventilated with air from directly conditioned spaces. For example, if exhaust hoods draw air through a kitchen from the dining room at a rate exceeding three air changes per hour, then the kitchen will be considered indirectly conditioned space.

Example 2-5: Indirectly Conditioned Space (by conduction)

Question

The accompanying sketch shows a building with three unconditioned spaces (none has a direct source of mechanical heating or cooling). The air transfer rate from the adjacent conditioned spaces is less than 3 air changes per hour. The area weighted heat transfer coefficients of the walls (UA) are shown on the sketch. The roof/ceiling area weighted heat transfer coefficients (UA) for each of the three unconditioned spaces is 90 Btu/Hr -°F.

Are any of these spaces indirectly conditioned?



Answer

Because the air change rate is low, we evaluate each space on the basis of heat transfer coefficients through the walls and roof. It is further assumed that the floors are adiabatic. Therefore, the heat transfer will be proportional to the area weighted heat transfer coefficients of the walls and roof/ceilings.

SPACE A: *The area weighted heat transfer coefficient to directly conditioned space is 3 x (75 Btu/Hr-°F) = 225 Btu/Hr-°F. The area weighted heat transfer coefficient to the outdoors or to unconditioned space is 70 Btu/Hr-°F + 90 Btu/Hr-°F = 160 Btu/Hr-°F. Since the heat transfer coefficient from Space A to the conditioned space is greater than heat transfer coefficient from Space A to outside, Space A is considered indirectly conditioned.*

SPACE B: *The area weighted heat transfer coefficient to directly conditioned space is 75 Btu/Hr-°F. The area weighted heat transfer coefficient to the outdoors or to unconditioned space is (3 x 70 Btu/Hr-°F) + 90 Btu/Hr-°F = 300 Btu/Hr-°F. Since the heat transfer coefficient from Space B to the conditioned space is less than the heat transfer coefficient from Space B to outside, Space B is considered unconditioned.*

SPACE C: *The area weighted heat transfer coefficient to directly conditioned space is (2 x 75 Btu/Hr-°F = 150 Btu/Hr-°F. The area weighted heat transfer coefficient to the outdoors or to unconditioned space is (2 x 70 Btu/Hr-°F) + 90 Btu/Hr-°F = 230 Btu/Hr-°F. Since the heat transfer coefficient from Space C to the conditioned space is less than the heat transfer coefficient from Space C to outside, Space C is considered unconditioned.*

Mechanical Cooling *is lowering the temperature within a space using refrigerant compressors or absorbers, desiccant dehumidifiers, or other systems that require energy from depletable sources to directly condition the space. In nonresidential, high-rise residential, and hotel/motel buildings, cooling of a space by direct or indirect evaporation of water alone is not considered mechanical cooling (see also "directly conditioned space").* For buildings covered by this *Manual,* evaporative cooling is not considered mechanical cooling. This means, for example, that a warehouse with only evaporative coolers does not meet the definition of mechanical cooling. Nonresidential buildings with evaporate cooling are a semi-conditioned space.

Mechanical Heating *is raising the temperature within a space using electric resistance heaters, fossil fuel burners, heat pumps, or other systems that require energy from depletable sources to directly conditioned space.* If the source of the heat is a nondepletable source, then the system is not considered mechanical heating. Nondepletable sources would include solar collectors, geothermal sources, and heat recovered from a process, such as refrigeration chillers.

Newly Conditioned Space *is any space being converted from unconditioned to directly conditioned or indirectly conditioned space, or any space being converted from semi-conditioned to directly conditioned or indirectly conditioned space. Newly conditioned space must comply with the requirements for an addition.*

Process *is an activity or treatment that is not related to the space conditioning, lighting, service water heating, or ventilating of a building as it relates to human occupancy.*

Semi-Conditioned Space *is an enclosed nonresidential space that is provided with wood heating, cooling by direct or indirect evaporation of water, mechanical heating that has a capacity of 10 Btu/(hr ft^2) or less, mechanical cooling that has a capacity of 5 Btu/(hr ft^2) or less, or is maintained for a process environment as set forth in the definition of DIRECTLY CONDITIONED SPACE.* Buildings that are semi-conditioned must meet the lighting requirements of the *Standards* (see Chapter 5). No mechanical or envelope compliance is required as long as the building is maintained as a semi-conditioned space.

Space Conditioning System *is a system that provides either collectively or individually heating, ventilating, or cooling within or associated with conditioned spaces in a building.* The *Standards* apply to conditioned space, and they govern the space conditioning systems that provide the conditioning for those spaces.

Unconditioned Space *is enclosed space within a building that is not directly conditioned, indirectly conditioned or semi-conditioned space.* Unconditioned space is not covered by the *Standards*

B. Occupancies

High-Rise Residential *is a building, other than a hotel/motel, of occupancy group R-1 with four or more habitable stories.* UBC Occupancy Group R-1 includes apartment houses, convents and monasteries (accommodating more than 10 persons). (See definition of Unconditioned Space above). If a building has four or more habitable stories, any residential occupancy in the building is considered high-rise residential, regardless of the number of stories that are residential.

Example 2-6: High-Rise Residential

Question

A four-story building has one floor retail, two floors are offices and the fourth floor is residential (as defined in the UBC). Is the residential space high-rise or low-rise?

Answer

It is a high-rise residential space. Even though there is only one floor of residential occupancy, the building has four habitable stories, making it a high-rise building.

Hotel/Motel *is a building or buildings incorporating six or more guest rooms or a lobby serving six or more guest rooms, where the guest rooms are intended or designed to be used, or which are used, rented, or hired out to be occupied, or which are occupied for sleeping purposes by guests, and all conditioned spaces within the same building envelope. Hotel/motel also includes all conditioned spaces that are (1) on the same property as the hotel/motel, (2) served by the same central HVAC system as the hotel/motel, and (3) integrally related to the functioning of the hotel/motel as such, including, but not limited to, exhibition facilities, meeting and conference facilities, food service facilities, lobbies and laundries.* A key part of this definition is that the hotel/motel includes all spaces within the same building envelope as the lobby or the guest rooms. This is because hotel/motel buildings are generally multi-purpose facilities. They may include such diverse spaces as restaurants, auditoriums, retail stores, offices, kitchens, laundries and swimming pools. All are treated as hotel/motel spaces.

This concept extends to other buildings associated with the hotel/motel that pass the three tests:

- Same property
- Same central HVAC system
- Integrally related to the hotel/motel

Refer also to Section 6.2 for a complete discussion of hotel/motel compliance issues.

Mixed Occupancies The *Standards* apply to mixed occupancies in the same way they apply to single occupancy buildings. The low-rise residential *Standards* apply to applicable occupancies; the nonresidential *Standards* apply to appropriate occupancies. If these two types occur in the same building, the building must be treated as two separate buildings for purposes of energy compliance, with each part meeting its applicable requirements. An exception provides that if one occupancy makes up 90% of the building, the entire building may comply with the provisions of the dominant occupancy. The mandatory measures for the actual occupancy will apply. This subject is discussed and illustrated in greater detail in Section 2.2.6C.

Other Occupancy Definitions: There are over 35 additional occupancy definitions in the *Standards*. They are used primarily to assign lighting area categories. Refer to the Glossary, Appendix G, for these definitions. All are found alphabetically under "Occupancy Type."

2.2 APPLICATION SCENARIOS

This section illustrates the use of the application rules in typical building situations.

2.2.1 Unconditioned Space

Unconditioned space is neither directly nor indirectly nor semi-conditioned, as defined in the previous section. Unconditioned space is not subject to the *Energy Efficiency Standards*. Some typical examples of spaces that may be unconditioned:

- Parking structures
- Automotive workshops
- Covered entry courts or walkways
- Outdoor dining areas
- Greenhouses
- Loading docks
- Mechanical/electrical equipment rooms

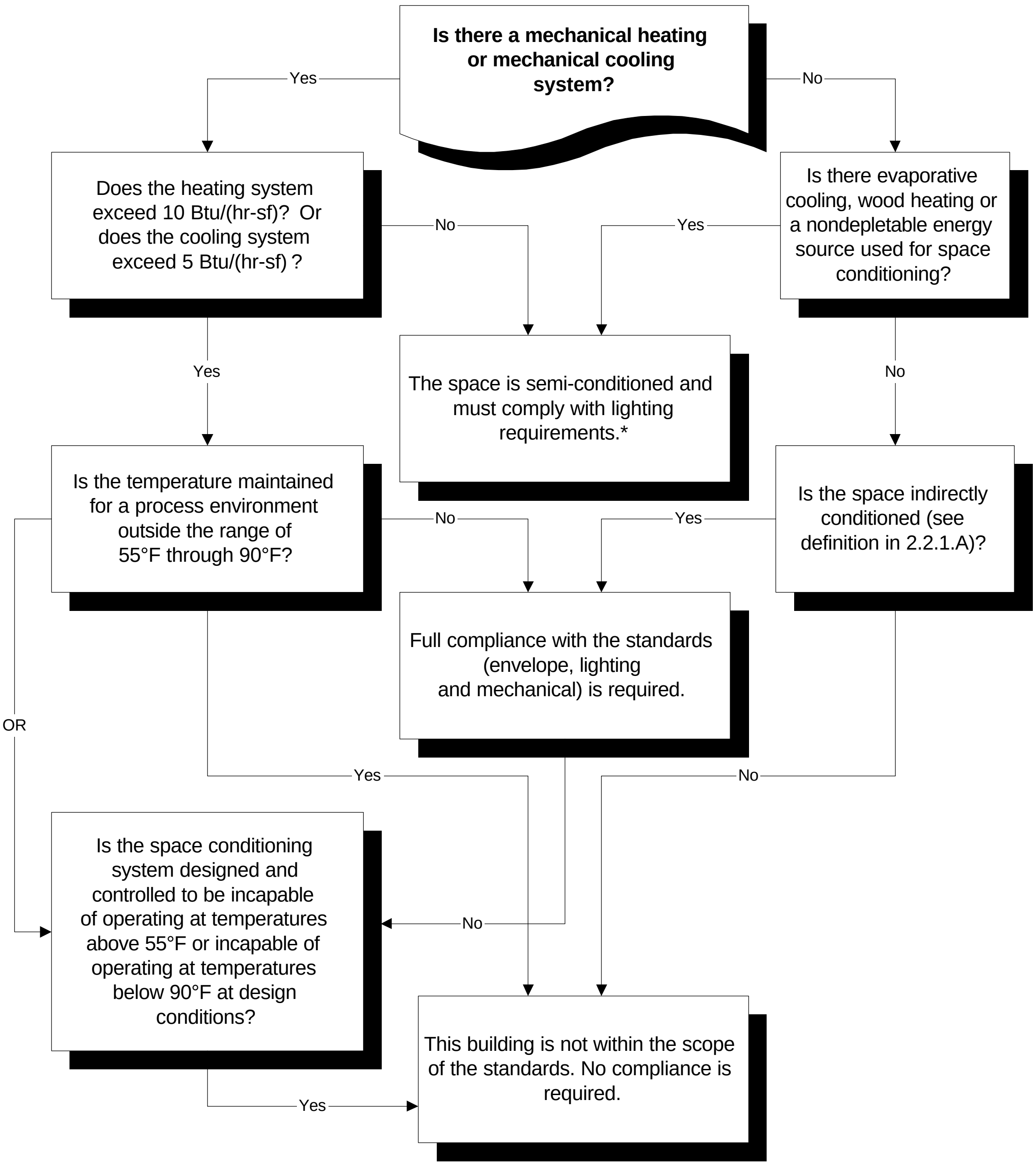
Keep in mind that these kinds of spaces are not always unconditioned. The specifics of each case must be determined. See the flowchart in Figure 2-1 to determine whether a space is unconditioned, conditioned, or semi-conditioned.

2.2.2 Newly Conditioned Space

While unconditioned buildings do not have to comply with the *Standards,* it is not simple to change an unconditioned building to a conditioned building.

When previously unconditioned space becomes conditioned, the space is then considered an "addition" and all the building's components must then comply as if it were a new building (see Section 2.2.5 below and *Standards* Section 149(a).) If conditioning an existing building results in a space that is semi-conditioned, the *Standards* do not apply.

Figure 2-1: Type of Conditioned Space and Scope of Compliance



*In an alteration, if space conditioning is added to an existing unconditioned building, resulting in it being semi-conditioned, no requirements apply. If space conditioning is added to an existing unconditioned building, resulting in it becoming conditioned, full compliance is required.

This situation has potentially significant construction and cost implications. For example, if an unconditioned warehouse is upgraded with a heating system thus becoming conditioned space, the building envelope must comply with the current envelope requirements and the lighting system must be brought into conformance with the current lighting requirements, including mandatory wiring and switching. If the envelope has large windows, it is conceivable that some would have to be blocked off. If the lighting system is inefficient, fixtures might have to be removed and new, more efficient fixtures installed.

This requirement can cause difficulty when an owner of a building seeks exemption from complying with the *Standards* by erecting a shell with no plans to condition it. For example, the owner of an office building obtains a permit for the structure and envelope, but wishes to leave the space conditioning and lighting improvements to the tenants. If that owner claims unconditioned status for that building, the owner does not have to demonstrate compliance with the envelope requirements of the *Standards.* As soon as the tenant applies for a permit to install the HVAC equipment, however, the envelope and any existing lighting in the shell must then be brought into full compliance. (This is the only circumstance when systems, other than those subject to the current permit application, fall under the *Standards.*) If the building was initially designed in a way that makes this envelope compliance difficult, the building envelope may require expensive alterations to bring it into compliance. A similar situation could occur with the lighting system if it is installed in the "unconditioned" building.

Many building departments require the owner to sign an affidavit at the time of the initial building permit for the shell, acknowledging the potential difficulties of future envelope or lighting compliance. For a discussion of the compliance procedures associated with this practice, refer to Sections 3.3, 4.3 and 5.3.

To minimize *Standards* compliance difficulties, the recommended practice is to demonstrate energy compliance at the time the envelope is built, and to do the same for the lighting system.

2.2.3 New Construction in Existing Buildings

Alterations, tenant improvements, and repairs are new construction in an existing building. For example, the base building has been constructed, but the individual tenant spaces have not been completed. Tenant improvements can include work on the envelope, the mechanical or the lighting systems. Whatever the case, the system or systems being installed are considered to be new construction, and must comply with some or all of the current *Standards*, depending on the extent of the changes (see following sections).

The only circumstance when systems other than those subject to the current permit application come under scrutiny is when the tenant improvement results in the conditioning of previously unconditioned space. Refer to the previous Section 2.2.2 for a complete discussion of this situation.

2.2.4 Alterations to Occupied Spaces

Alteration *is any change to a building's water heating system, space conditioning system, lighting system, or envelope that is not an addition.* Alterations or renovations to existing conditioned spaces have their own set of rules for energy compliance. They are covered in a separate section of the *Standards,* Section 149(b). (Additions are discussed in Section 2.2.5.)

In summary, the alteration rules are:

1. The *Standards* apply only to those portions of the systems being altered; untouched portions need not comply with the *Standards*.

2. If an envelope or lighting alteration increases the energy use of the altered systems, the alteration must comply with the current *Standards*.

3. Alterations must comply with the mandatory measures for the changed components.

4. New systems in the alteration must comply with the current *Standards*.

5. In an existing semi-conditioned building, altered lighting must meet mandatory measures for the changed lighting component. Alterations that increase the connected lighting load or replace more than 50% of the lighting fixtures must meet current *Standards*.

6. In an existing, unconditioned building where evaporative cooling is added (making the building semi-conditioned) the existing unaltered envelope and lighting do not need to be brought into compliance with current *Standards*.

The effect of these rules is that, in most cases the existing systems (envelope and lighting) set the standard for the altered systems. For example, if the existing lighting system is changed but does not increase the connected lighting load, does not replace more than 50% of fixtures, but meets the applicable mandatory measures, it complies. The same holds true for changes to the envelope: if the overall heat loss or heat gain is not increased and it meets its applicable mandatory measures, then it complies. Mechanical system alterations are governed primarily by the mandatory measures.

The alternative alteration rule is to make changes to the existing building so that the entire building (existing and alteration) complies with the performance approach of the current *Standards*. Keep in mind that, under the performance approach, credit is given only for systems that are actually changed in the current construction process (see Section 6.1 and *Standards* Section 149(b)).

Example 2-7: New Window

Question

An owner wants to add a new window in an old building. This will increase the glazing area. How do the Standards apply?

Answer

Envelope alterations require demonstrating that the overall heat gain and heat loss are not increased. However, the heat gain calculation considers only glazing (i.e., only measures which offset the heat gain, such as tinting, are considered), making it is difficult to achieve compliance with this option.

The option is also available to meet the current requirements for the component being altered. This means meeting the glass U-value, percentage, and shading requirements of the current standards. For example, a building in Climate Zone 9 would require a window U-value <1.23, relative solar heat gain of 0.62 (south, east and west) or 0.82 (north), and the total area of fenestration (existing and new) is limited to 40% of the gross exterior wall area (considering only the altered wall of the permitted space).

Example 2-8: New Lighting Fixture

Question

A building owner wants to change existing lighting fixtures with new ones. Do the Standards restrict the change in any way?

Answer

If more than 50% of the fixtures are replaced, or the connected load is increased, the Standards will treat this as a new lighting system that must comply with Section 146. Any applicable mandatory requirement affected by the alteration applies, and the mandatory switching requirements would apply to the improved system if the circuiting were altered. Title 20 Appliance Efficiency Regulations requirements for ballasts would also apply. See Section 5.2.1.

Example 2-9: New Interior Partitions

Question

A building owner wants to rearrange some interior partitions and re-position the light fixtures in the affected rooms. Do the energy Standards apply to the work?

Answer

Each of the newly arranged rooms must have its own light switches. Since there is no change in the connected lighting load or the exterior envelope, only the mandatory light switching requirements would apply. Refer to Section 5.2.1 for more detail on these requirements.

Example 2-10: Altered Duct Work

Question

A building owner wants to re-arrange some duct work and add some additional fan coils to an existing HVAC system to improve comfort. Do the energy Standards apply to the work?

Answer

There would be no change in the load on the system nor any increase in its overall capacity,so the Standards would not apply to the central system. Only the duct construction requirements apply to altered ducting (see Section 4.2.1J).

Example 2-11: Chiller Replacement

Question

A building owner wants to replace an existing chiller. No other changes will be made to the HVAC system. Do the Standards restrict the change in any way?

Answer

The mandatory efficiency requirements would govern the efficiency of the new chiller (see Section 4.2.1A). The other parts of the system are unchanged and therefore unaffected by the Standards.

Example 2-12: Adding a Mezzanine

Question

A building owner has a high ceiling space and wants to build a new mezzanine space within it. There will be no changes to the building envelope or to the central HVAC system. There will be new lighting installed. How do the Standards apply?

Answer

Since a mezzanine does not add volume, it is an alteration, not an addition. The existing systems are not affected unless they are altered. The new lighting must comply with all requirements of the standards. The envelope is unchanged, so there are no requirements for it. The mechanical system duct work is simply extended without increase in system capacity, so only the duct construction and insulation requirements apply.

2.2.5 Additions

Addition *is any change to a building that increases conditioned floor area and conditioned volume.*

Additions involve either the construction of new, conditioned space and conditioned volume, or the installation of space conditioning in a previously unconditioned space. The mandatory measures, and either the prescriptive or the performance requirements apply. The heating, lighting, envelope, and water heating systems of additions are treated the same as for new buildings. The only exception to this is if the existing systems are simply extended into the addition (*Standards* exception to Section 149(a)). Refer above to Section 2.2.2 for further discussion of previously unconditioned space.

There are three options for the energy compliance of additions under the *Standards*:

Option 1: Treat the addition as a stand-alone building with adiabatic walls to conditioned space (Section 149(a)1. and (Section 149(a)2.B.1.). This option can employ either the prescriptive or the performance approach.

Adiabatic means the common walls are assumed to have no heat transfer between the addition and the adjacent conditioned space, and are ignored entirely.

Option 2: Combine the existing building with the addition (Section 149(a)2.B.2.). This option only works with the performance approach. It uses the custom budget approach to develop an energy budget for the existing building and a standard version of the addition. These combine into a total building energy budget. The combined building is then modeled as proposed. If it meets the budget, the addition complies.

This option will generally work to ease the energy requirements of the addition only if there are energy improvements to the existing building. It does allow the designer to make a relatively energy inefficient addition comply.

Option 3: The existing structure combined with the addition can be shown to comply as a whole building with all requirements of the current *Standards* for envelope, lighting and mechanical.

Example 2-13: Energy Inefficient Addition

Question

A restaurant adds a greenhouse-style dining area with large areas of glazing. It is directly conditioned space. How can it comply with the Standards?

Answer

Because of its large glass area, it will not comply on its own. By making substantial energy improvements to the existing building (lighting, mechanical or envelope), it is possible for the combined building to comply. The performance approach would be used to model the combined existing/new building.

2.2.6 New Buildings

A. Speculative Buildings - Known Occupancy

Speculative buildings of known occupancy are commonly built by developers. For example, if a strip shopping center or an office building were built on speculation, the owner would usually know the ultimate occupancy of the space but might not know the actual tenants. For this type of building, the owner could take responsibility for any or all of the major components by simply building and showing energy compliance for the envelope, and leaving the lighting and HVAC improvements to the tenants (or the project could include the other systems as well).

Because compliance may be demonstrated for each component separately, the owner can simply demonstrate that the systems being built meet the *Standards*. The remaining construction and *Standards* compliance work can be dealt with as each tenant obtains building permits for work in their individual spaces (see Section 2.2.3).

Often, the developer will seek to minimize first cost by delaying compliance and construction of as much of the project as possible. While this can be done under the *Standards,* there are two disadvantages:

1. If all *Standards* compliance is deferred by declaring the building to be unconditioned, the owner needs to understand the potential problems that could arise later when the building is conditioned. Refer to the discussion in Section 2.2.2 above.

2. If only the envelope or lighting systems are shown to comply, the owner loses the opportunity to apply the performance approach to the entire building and so to make trade-offs between systems to optimize the cost-effectiveness of the design.

B. Speculative Buildings - Unknown Occupancy

Speculative buildings are often built for which the ultimate occupancy is determined at the time of leasing and not during construction of the building shell. The structure, for example, could eventually be used as an office, a warehouse, a restaurant or retail space. Because the *Standards* treat these occupancies in a similar fashion, the fact that the ultimate occupancy is unknown is not a significant problem. The major items affected by the ultimate occupancy have to do with lighting and ventilation requirements.

The major problem that can occur with this type of building comes when the owner elects to declare it as an unconditioned building and defer *Standards* compliance until such time as a tenant installs mechanical space conditioning equipment. Refer to Section 2.2.2 for a complete discussion of this problem.

C. Mixed Use Buildings

Because the *Standards* are different for residential and nonresidential buildings, and because mixed use buildings occasionally include more than one type of occupancy, there is potential for confusion in application. The *Standards* address these circumstances regarding mixed use buildings:

1. **Minor Occupancy** (exception to Section 100(e)). If the minor occupancy or occupancies occupy less than 10% of the total conditioned floor area, then they are treated as if they were of the major occupancy. The mandatory measures applicable to the minor occupancy, if different from the major occupancy, would still apply.

Example 2-14: Minor Occupancy

Question
A 250,000 sf high-rise office building includes a small 500 sf apartment for use by visiting executives. This is clearly a residential occupancy, so is the apartment required to meet the residential requirements of the Standards?
Answer
No. It occupies less than 10% of the total conditioned floor area, so it is a minor occupancy and may be treated as part of the office occupancy. Residential mandatory measures apply.

2. **Different Nonresidential Occupancies**. When both of these occupancies fall under the nonresidential *Standards*, they would be dealt with together under the same compliance process. Although the occupancies may have different envelope and lighting requirements, these are not so different as to require special compliance procedures.

3. **Hotel/motel and Nonresidential Occupancies.** A hotel/motel with guest rooms, restaurants, sports facilities and other nonresidential occupancies is defined as a hotel/motel occupancy (see Section 2.1.2B and *Standards* Section 101(b)). The only variance is that the guestroom envelope and lighting and HVAC control requirements are different.

4. **Mixed Low Rise Residential and Nonresidential Occupancies.** These occupancies fall under different sets of *Standards,* they are considered separately. Two compliance submittals must be prepared, each using the calculations and forms of its respective *Standards*.

D. Semi-Conditioned Buildings

Some buildings such as warehouses may fall into the category of a semi-conditioned building (see 2.2.1 to determine if a space is unconditioned or semi-conditioned). The *Standards* require only lighting compliance in buildings that are semi-conditioned.

2.2.7 Change of Occupancy

A change of occupancy alone does not require any action under the energy *Standards*. If changes are made to the building, however, then the rules for alterations or additions apply (see Sections 2.2.4 and 2.2.5).

If the change in occupancy involves converting from a residential to a nonresidential occupancy or vice versa (changes defined by UBC occupancy definitions), then the *Standards* applicable to the new occupancy would govern any alterations made to the building. For example, if a home is converted to law offices, and a new lighting system is installed, the nonresidential lighting requirements would apply. If a new HVAC system is installed, all the nonresidential HVAC requirements, would have to be met.

If no changes are proposed for the building, it is advisable to consider the ventilation requirements of the new occupancy. For example, if a residence is converted to a hair salon, the ventilation rates of the building should be considered. With new sources of indoor pollution, the existing residential ventilation rates would likely not be adequate for the new uses.

2.2.8 Repair

A Repair *is the reconstruction or renewal of any part of an existing building for the purpose of its maintenance. Repairs shall not increase the pre-existing energy consumption of the required component, system, or equipment.*

Chapter 2 Index

A

B

C

D

E

F

G

H

I

K

L

M

N